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COUNCILMEMBER GILDA FELLER

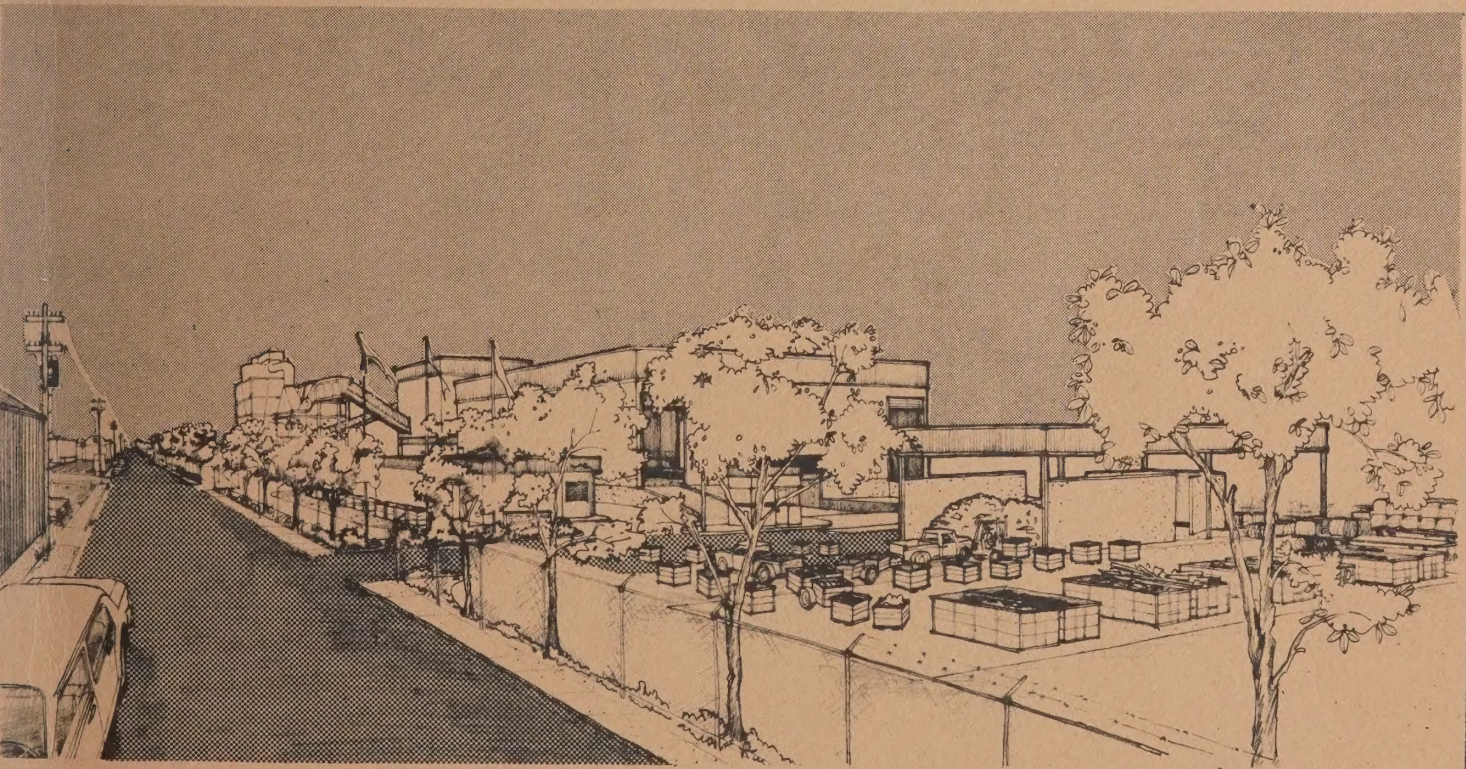
Civic Center Building

2180 Milvia Street

Berkeley, Calif. 94704

# SOLID WASTE MANAGEMENT CENTER

## EXECUTIVE SUMMARY-PHASE ONE AND TWO



## CITY OF BERKELEY



GARRETSON·ELMENDORF·ZINOV·REIBIN  
ARCHITECTS AND ENGINEERS

124 SPEAR ST., SAN FRANCISCO, CA 94105 · TELEPHONE 415-434-3838



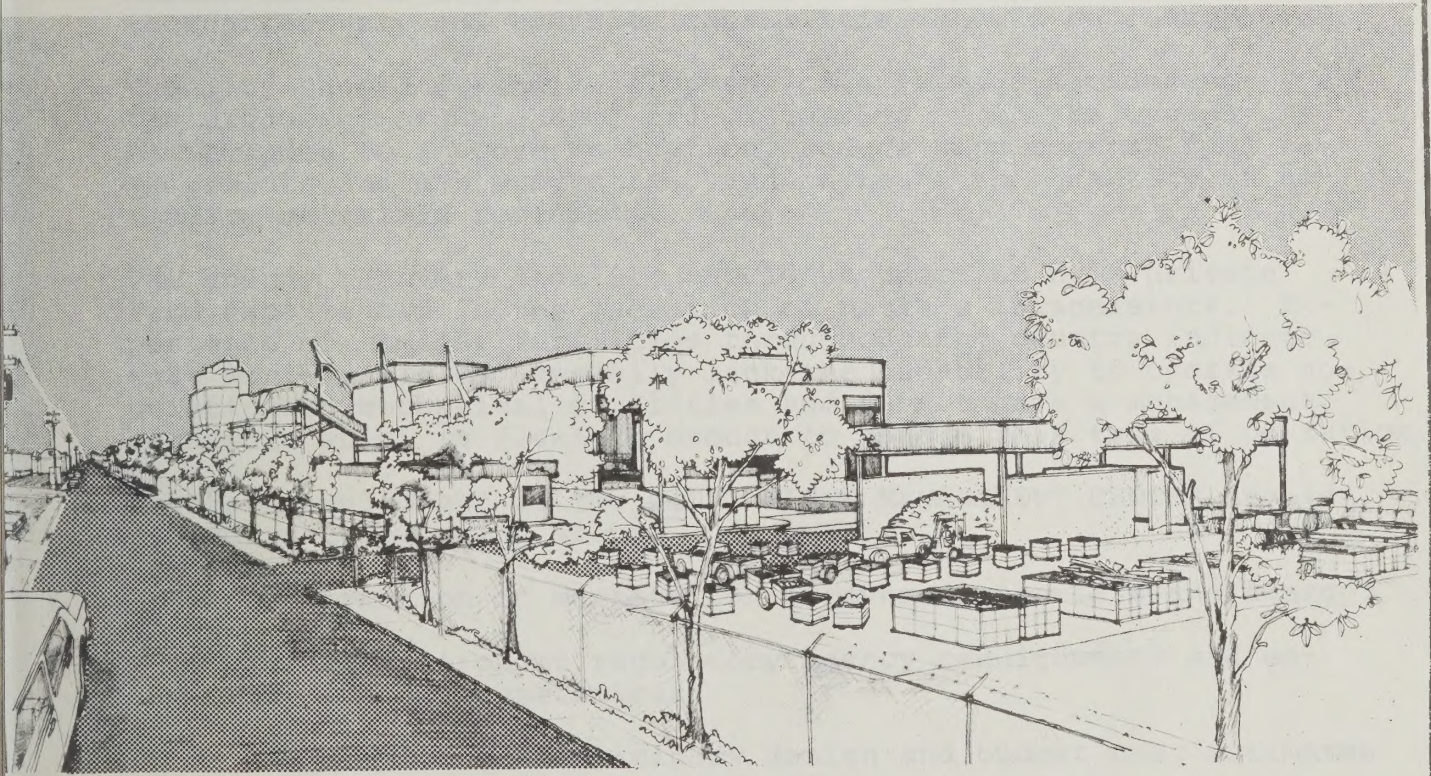




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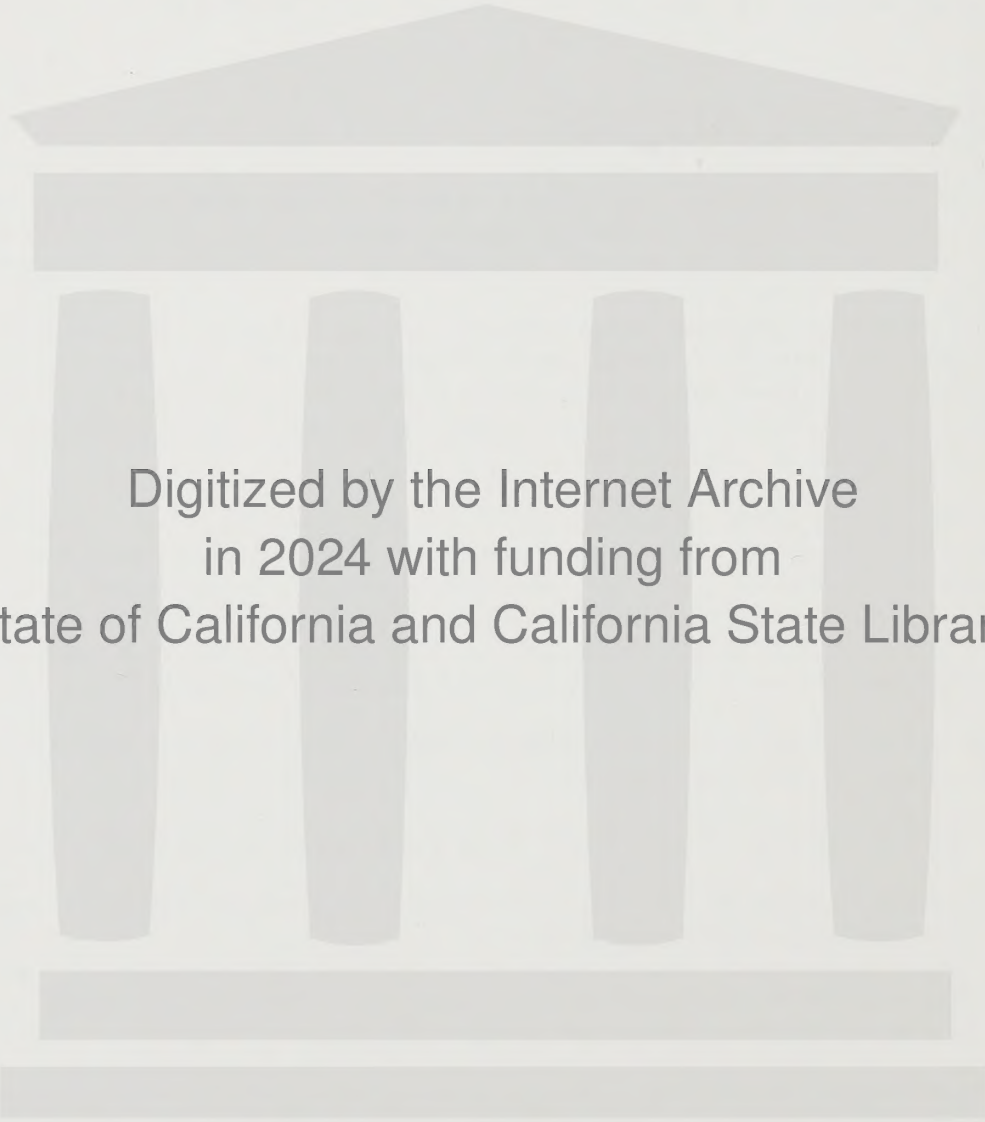
# STATEMENT OF PROBLEM

The Berkeley Landfill will be reaching its projected capacity by 1982. An alternative disposal means must be found and implemented prior to this date. The quantities of refuse and points of origin are presented in Table 1.

## RECOMMENDATIONS

- To minimize additional disposal costs after the closure of the Marina Landfill Site, a Solid Waste Management Center with resource recovery and transfer capabilities should be constructed.
- The City should pursue development of a Package Incinerator System producing steam. Some pre-processing of the refuse should be included to improve combustion, reduce supplemental fuel requirements and ash production, and increase the quantity of secondary materials reclaimed.
- The energy recovery facility should be operated by a private firm experienced in the operation of package incinerators. Experience of similar facilities throughout the country indicate that municipalities generally lack the capability to operate sophisticated mechanical facilities and do not have a management structure which is flexible enough to handle this type of operation.
- Further development of the SOLID WASTE MANAGEMENT CENTER should include the following steps:
  - Confirmation of markets for recovered materials and energy;
  - Identification of regulatory agency requirements and environmental constraints;
  - Preparation of preliminary design and budget cost estimates for the Package Incinerator Plant;
  - Development of financing and institutional arrangements;
  - Establishment of an Implementation Masterplan;
  - Preparation of Request for Proposals Documents and evaluation criteria for facility operation by private industry.

It is anticipated that a SB 650 planning grant would be available from the State Solid Waste Management Board to complete this work.



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# Table 1

## ESTIMATED REFUSE QUANTITIES TO BE HANDLED AT THE SOLID WASTE MANAGEMENT CENTER

		<u>Annual Tonnage</u>	
		Generated	Initially Available To SWMC
A.	Generated in Berkeley, disposed by Berkeley Landfill Company		
	• Residential	39,000	39,000
	• Commercial	12,000	12,000
	• Construction/Demolition	1,000	--
	• Unclassified Fill	<u>3,000</u>	<u>3,000</u>
	Subtotal	55,000	54,000
B.	Generated in neighboring communities, disposed by Berkeley Landfill Company		
	• Residential	4,000	4,000
	• Commercial/Industrial	<u>6,000</u>	<u>6,000</u>
	Subtotal	10,000	10,000
C.	Secondary materials recovered by Berkeley's neighborhood recycling organizations:		
	• Originating from Berkeley	2,700	2,700
	• Originating from neighboring communities	<u>700</u>	<u>700</u>
	Subtotal	3,400	3,400
D.	Plant debris recovered at the City operated pilot composting project		
	• Originating from Berkeley	1,500	--
	• Originating from neighboring communities	<u>700</u>	<u>--</u>
	Subtotal	2,200	--
E.	Generated in Berkeley, disposed at other landfill(s):		
	• Non-hazardous	44,100	--
	• Hazardous	<u>41,300</u>	<u>--</u>
	Subtotal	85,400	--
TOTAL		<u>156,000</u>	<u>67,400</u>







# PROJECT EVOLUTION

Anticipating the necessity for an alternative and more environmentally sound solid waste management system, the City Council established a Solid Waste Management Commission in 1972. The Commission was mandated to develop a short-term plan for reducing the quantity of solid waste generated and a long-term ecologically sound plan for managing the City's refuse in the future.

In 1973, in response to a recommendation by the Solid Waste Management Commission, the City Council decided to purchase a site for a solid waste transfer station. Shortly thereafter, two parcels of land were purchased on Second Street bounded by Gilman and Harrison Streets. An option on a third intermediate parcel was also obtained. The total proposed site encompasses 6.3 acres.

The City Council commissioned a study in 1975 to assemble data on refuse generation and disposal in Berkeley and study the relationship of Berkeley's resource recovery alternatives to suggested regional plans. This report recommended that the transfer station incorporate recovery processes to ensure the maximum reutilization of resources.

In 1976, the Commission prepared a source separation and waste reduction plan. The Commission recommended to the Council that curbside collection of source grouped materials be implemented and that space be allocated at the proposed transfer station site to incorporate a storage depot for collected materials and a public recycling center.

Concurrent with the development of the Commission's plan, the future utilization of a proposed seven acre tract of the Marina landfill site became questionable due to action taken by the Corps of Engineers and the Regional Water Quality Control Board. Faced with the possibility of early closure of the landfill, the City Council approved a recommendation by the Public Works Department to contract with consultants for preliminary engineering of a Solid Waste Management Center at the Gilman Street

site. Proposals were requested and the firm of Garretson•Elmendorf•Zinov•Reibin, Architects and Engineers, of San Francisco, California (G•E•Z•R) was selected to provide the preliminary engineering. Spectrum Northwest, Social and Environmental Planning Consultants, of San Francisco, was commissioned to prepare a corresponding environmental impact study.





In June, 1978, G•E•Z•R published SOLID WASTE MANAGEMENT CENTER - PHASE ONE. Phase One presents the preliminary design and cost estimates of a SWMC that incorporates the following functions:

- City-wide Recycling Center;
- Storage Depot for Source Grouped Materials;
- Transfer/Processing Station;
- Corporation Yard for Refuse Collection Vehicles.

Sparked by the interest of local industry in utilizing energy produced from refuse at the Solid Waste Management Center, a second phase of study was funded by the State Solid Waste Management Board. The Phase Two report, published in September, 1978, presents energy recovery alternatives and recommends an appropriate system for Berkeley.





# SCOPE OF WORK

The scope of work for Phase One was to develop a masterplan of the Gilman Street Site which would incorporate the Recycling Center, Storage Depot, Transfer/Processing Station, and Corporation Yard.

The objectives of the Solid Waste Management Center are to:

- Manage the City's solid wastes in a reliable, economically feasible and environmentally acceptable manner;
- Provide maximum flexibility for staged implementation of resource recovery options;
- Maximize recovery of waste materials;
- Accept wastes by early 1982.

The scope of work for Phase Two was as follows:

- To identify systems to recover resources and energy from the waste stream;
- To examine the technical reliability, environmental acceptability, energy productivity, and economic attractiveness of resource recovery units;
- To evaluate the compatibility of resource recovery systems with a city-wide source separation program;
- To propose for further consideration a system which would provide the City with a technically reliable, environmentally responsible and economically attractive method for recovering resources and energy from solid wastes.





# ALTERNATIVES CONSIDERED

Resource recovery alternatives and existing disposal alternatives for unprocessed solid wastes identified for evaluation in this study are ranked below in order of least cost per incoming ton. This indicator was utilized as it most nearly parallels the increased disposal costs to be borne by Berkeley citizens. All costs are in mid-1978 dollars, and do not include the cost of collection.

	System	Net Cost Per Ton (\$)	Annual Net Cost (\$)	Capital Cost (\$)
1.	Package Incinerators Producing Steam	\$ 9	\$ 585,000	\$ 6,600,000
2.	Transfer/Haul and Dis- posal at Acme Fill Company's Landfill	\$ 20	\$1,317,000	\$ 2,509,000
3.	Transfer/Haul and Dis- posal at Vasco Road Landfill	\$ 21	\$1,339,000	\$ 2,589,000
4.	Refuse Derived Fuel Production and Sale to City of Alameda	\$ 21	\$1,370,000	\$ 6,600,000
5.	Direct Haul to Acme Fill Company's Land- fill*	\$ 29	\$1,127,000	\$ 1,380,000
6.	Waterwall Combustion (Unprocessed)	\$ 30	\$1,956,000	\$16,500,000
7.	BSP Pyrolyser	\$ 30	\$1,946,000	\$12,000,000
8.	Andco-Torrax	\$ 35	\$2,241,000	\$18,200,000
9.	Direct Haul to Vasco Road Landfill*	\$ 38	\$1,472,250	\$ 1,440,000
10.	Waterwall Combustion (Refuse Derived Fuel)	\$ 41	\$2,626,000	\$16,500,000
11.	Waterwall Combustion (Shredded)	\$ 43	\$2,766,000	\$18,600,000

\* Based only on those tons currently collected by City Crews, 39,000 tons per year; citizens and private collectors would be responsible for transporting the remaining tonnage (25,400) at their own expense.

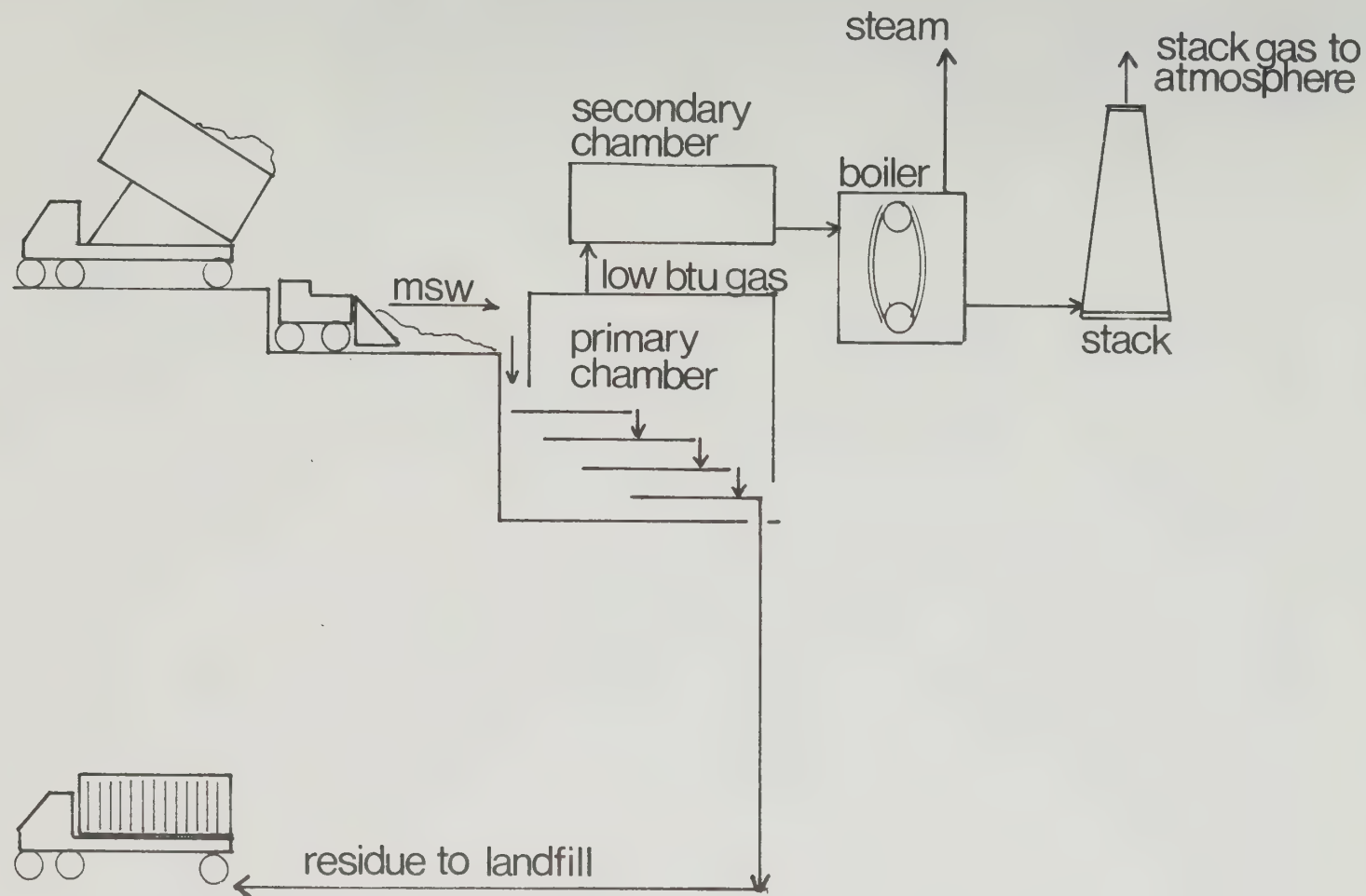




# FINDINGS

- Implementation of the SWMC offers the City significant opportunity to recover currently wasted resources, and reduce the disposal costs that would be incurred by direct hauling to a distant landfill after closure of the Marina site.
- The least costly resource recovery alternative considered for the Solid Waste Management Center is a Package Incinerator System producing steam. A Package Incinerator System (Figure 1) utilizes the energy value of solid waste to heat water to produce steam. Solid waste is fed into a primary chamber, where it is burned slowly under controlled air conditions. The resulting hot gases are passed through a second chamber, where excess air is injected to allow complete combustion. Auxiliary fuel is required in minimal quantities to maintain proper combustion temperatures. The particulate matter burns off, and the hot effluent is passed through a waste heat boiler to produce steam. The steam can then be used to generate electricity with the addition of a turbine generator if desired. The incinerators are factory built, highway shippable, and can be assembled into clusters of two or three.
- A Package Incinerator System can recover up to 66 percent of the refuse to be handled at the SWMC. Remaining residues will require landfilling.
- Based on recent improvements in equipment, the redundancy of modular components, and the operating experience of existing facilities, Package Incineration can be considered a reliable technology. There are currently 12 package incinerator facilities processing municipal refuse in the United States, three (3) of which generate steam.
- Two currently unanswered environmental questions remain which are common to all the resource recovery systems evaluated - the extent of air pollution and classification of residuals (bottom and fly ash). The analysis being conducted by the Environmental Protection Agency and the State Solid Waste Management Board on the Package Incinerator facility in North Little Rock, Arkansas, is expected to supply required data to resolve these issues. There are no other unmitigable environmental impacts with respect to a Package Incinerator System.
- Twelve (12) entities (private firms and public institutions) have expressed interest in purchasing refuse derived steam produced from a Berkeley facility.





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CITY OF BERKELEY  
TYPICAL PACKAGE  
INCINERATOR

1  
FIGURE





- A Package Incinerator System is compatible with on-site recovery of large quantities of ferrous metals. However, if recovery of significant quantities of glass and aluminum is to be part of the City's resource recovery program, a source separation system incorporating Curbside Collection and a City-wide Recycling Center is required. A further advantage of a source separation program is that paper products are recycled into new products, rather than burned for its energy value. This permits significant environmental benefits.
- Source separation operating in conjunction with a Package Incinerator System can recover up to 70 percent of the refuse to be handled at the SWMC.
- Revenue accrued from the Refuse Development Fund by the proposed time of facility construction will not provide sufficient capital to construct the necessary facilities. Other monies might be available from the State Solid Waste Management Board (through SB 650 funding) and from private firms interested in participating in the project.





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